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New species of South African acanthodriline earthworms of the genera *Eodriloides* and *Chilota*, with a redescription of *Chilota quindecimus* (Oligochaeta: Acanthodrilidae)

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ABSTRACT

The endemic acanthodriline species *Eodriloides thompsoni* sp. n. and *Chilota dilatus* sp. n. are described and illustrated. The earlier known *Chilota quindecimus* Pickford, 1937 is re-examined and more completely described from the first available mature specimens. Diagnostic characters of the genera and new species are provided. All three species are known from KwaZulu-Natal only.

KEY WORDS: Oligochaeta, Clitellata, Acanthodrilidae, Acanthodrilinae, *Eodriloides*, *Chilota*, new species, taxonomy, South Africa, KwaZulu-Natal.

INTRODUCTION

Our knowledge of the South African endemic taxa of the Gondwanan family Acanthodrilidae is gradually improving through the acquisition of new material in the Oligochaeta Collection of the Natal Museum. Collections made in nature reserves in KwaZulu-Natal include undescribed species in the acanthodriline genera *Eodriloides* and *Chilota*. Two of these new species are described and illustrated here. A redescription is provided for *Chilota quindecimus* Pickford, 1937, which was originally based on a single immature specimen, but is now represented by fully mature individuals. New material indicates that the species occurs in the KwaZulu-Natal Midlands.

MATERIAL AND METHODS

The material studied was obtained from samples collected by staff of Ezemvelo KZN Wildlife in Pietermaritzburg and donated to the Natal Museum Oligochaeta Collection. The specimens were narcotised in 45% ethanol, then fixed in 4% formalin solution in which they were kept for a few days; thereafter, they were transferred to 75% ethanol. Dorsal longitudinal dissections were performed for the internal anatomy. The photographs were taken with a Wild Heerbrugg M8 stereomicroscope. Data recorded for this material include depository acronym, registration number in the Natal Museum collection, locality data including name of the province, followed by co-ordinates given in brackets, short information on biotopes, collecting date, number of specimens and the name of the collector. All information was taken from the original labels. The methods and terminology used follow an earlier publication (Plisko 2004); however 'male funnels' replace the term 'spermiductal funnels' used previously. Generic characterisations follow those of Michaelsen (1899), Pickford (1937), and Zicsi (1998), emended by Plisko (2004).

The following abbreviations and acronyms are used: cl – clitellate; juv – juvenile; KZN – KwaZulu-Natal; NMSA – Natal Museum, Pietermaritzburg, South Africa; SAMC – South African Museum, Cape Town, South Africa.

TAXONOMY

Subfamily Acanthodrilinae Claus, 1880

Genus *Eodriloides* Zicsi, 1998

Eodriloides: Zicsi 1998: 62.

Diagnosis: Male reproductive organs acanthodriline. Holandric. Excretory system avesiculate. Prostatic pores and male pores ventrolateral, not approximating towards the midventral line. Spermathecae with more than one, variably shaped diverticulum. Male pores paired, in 18 or 17/18. Gizzard in 5, developed variably: well-developed, reduced or rudimentary. Last pair of lateral hearts in 12 or 13.

Eodriloides thompsoni sp. n.

Figs 1, 2

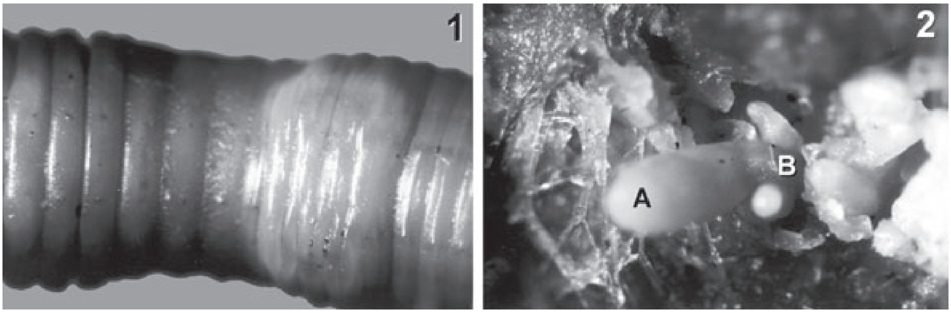
Etymology: The name is given in honour of Dr P. Thompson (Ezemvelo KZN Wildlife).

Diagnosis: One pair of male pores in 18. Spermathecal pores in 7/8 and 8/9 in ventrolateral position. Two pairs of bilobate spermathecae; each spermatheca with two slender diverticula. Seminal vesicles paired, in 9 and 11. Prostatic pores in 17 and 19. Gizzard in 5, large. Last pair of lateral hearts in 13. Intestine begins in 17.

Description:

External features: Body cylindrical. *Colour*: alcohol-preserved material violet-reddish dorsally extending to the *c* setal lines, and circularly on the last four posterior segments; ventrally yellowish white. *Dimensions*: holotype 52×2.7 mm; paratype 42×2.8 mm. *Segment number*: holotype 124; paratype 95. *Prostomium*: epilobous, open into approx. half of first segment. *Setae*: widely paired; on postclitellar segments *aa*>*bc*, *ab*<*cd*, *cd*<*bc*. *Dorsal pores*: not observed. *Nephridial pores*: observed only on few postclitellar segments in *c* setal line. *Spermathecal pores*: two pairs, clearly noticeable in intersegmental furrows 7/8 and 8/9, in front of *b* setae. *Female pores*: in 14 in front of *b* setae. *Clitellum*: on 13–16; clitellar borders anteriorly and posteriorly distinct. *Prostatic pores*: ventrolaterally, in segment 17 and 19, respectively, each pore on enlarged (Fig. 1), swollen part of segment. *Male pores*: in 18, in small openings lateral to *b* setae. *Seminal grooves*: curved furrows between prostatic pores. *Papillae*: prominent on 16, in front of prostatic pores.

Internal characters: *Salivary glands*: not extending beyond septum 4/5, dorsally touching the anterior part of gizzard. *Gizzard*: cylindrical, large, somewhat muscular, although soft. *Septa*: anterior septa not thickened; 11/12–15/16 slightly thickened. *Intestine*: begins in 17, preceded by enlarged, muscular, folded region of oesophagus in segments 12–14, followed in segments 15–16 by constricted, much narrower part forming valves. *Typhlosole*: not present. *Lateral hearts*: four pairs, with last pair in 13. *Nephridia*: meganephridia; elongated, thin, without terminal vesicles. *Ovaries*: not observed. *Testes* and *male funnels*: funnels large; first pair medially in segment 10, second pair lateromedially in segment 11; free, iridescent. *Vasa deferentia*: not observed, probably deeply embedded in body wall. *Seminal vesicles*: two pairs; anterior pair dorsally in 9, lobulated, commencing from ventral part of septum 9/10; posterior pair commencing from septum 10/11, large, extending into 11. *Spermathecae*: two pairs, bilobate (Fig. 2); in 8 and 9, respectively; ampulla elongated, folded, with wide duct, at base of which are two slender



Figs 1, 2. *Eodriloides thompsoni* sp. n., holotype: (1) ventral area with prostatic pores, 180×; (2) anterior right spermatheca, 300×. Abbreviations: A – ampulla, B – bilobate diverticulum.

diverticula, similar in size and appearance. Spermathecal ectal openings in intersegmental furrow 7/8 and 8/9. Iridescent sperm was observed only in lower parts of diverticula. *Prostates*: two pairs; each prostatic gland tubular, multi-folded, tortuous extending into short, slender prostatic duct; ectal openings in segment 17 and 19, respectively. Each tubular gland together with prostatic duct extends in two segments, anterior pair in 16–17, posterior in 19–20. *Penial setal retractor muscles*: not observed.

Holotype: NMSA/Olig.03474. *KwaZulu-Natal*: Karkloof Nature Reserve (29°16'50.654"S:30°16'52.420"E), Melmoth farm, hillside rocky grassland, among mole-rat mounds, 9.x.2001, A.J. Armstrong, P. Ngwenya.

Paratype: NMSA/Olig.03633, 1 cl collected together with holotype.

Discussion: *E. thompsoni* being holandric and having nephridia without terminal vesicles agrees with characters proposed by Zicsi (1998) for *Eodriloides*. The position of the last pair of lateral hearts in segment 13 is distinctive for this species, although it is also known in *E. octocordatus* recorded from the southern part of the Eastern Cape and the south-eastern Western Cape (Pickford 1937; Zicsi 1998). However, the start of the intestine in the new species is in segment 17, whereas in *E. octocordatus* the intestine initiates more posteriorly (18/19–20/21). The two species also differ in the shapes of their spermathecae.

Biological notes and distribution: Two mature specimens were collected at the beginning of spring. The presence of iridescent sperm observed in the male funnels and in the lower part of the spermathecal diverticula in both dissected specimens confirms sexual activity. *E. thompsoni* has been found together with the indigenous microchaetid *Tritogenia lunata* Plisko, 1997 and juvenile *Proandricus* species, and also with introduced megascolecid *Amynthas* species. This species is known only from Karkloof Nature Reserve, KZN. The collection site has been part of a nature reserve for the past 25 years, under protection by Ezemvelo KZN Wildlife; earlier, it was a private farm for many years. This species is known only from the type locality.

Genus *Chilota* Michaelsen, 1899 emend. Pickford, 1937

Chilota: Michaelsen 1899: 237; Pickford 1937: 437.

Diagnosis: Male reproductive organs acanthodriline. Proandric. Excretory system vesiculate. Prostatic pores and male pores ventrolaterally, not approximating towards the middle-ventral line. Male pores paired, in 18. Two pairs of spermathecae; spermatheca with one or more, variable shaped diverticulum. Commencement of intestine variable:

in 15, or 16, or 17. Gizzard in 5 or 6, developed variably: well-developed, moderate, or rudimentary. Last pair of lateral hearts in 12 or 13.

Chilota dilatus sp. n.

Figs 3–5

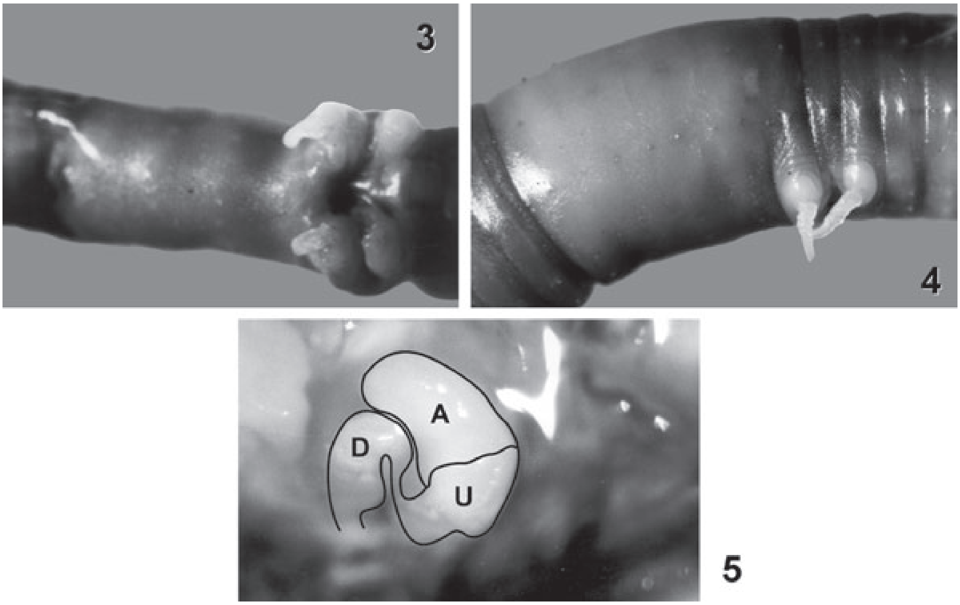
Etymology: Latin *dilatus* (extended). Refers to projecting prostatic papillae.

Diagnosis: Clitellum circular, on 13–1/n17. Prostatic pores in 17 and 19 on prominent papillae extending into curved hook. Salivary glands not extending beyond septum 4/5. Gizzard in 5. Commencement of intestine in 15. Last pair of lateral hearts in 12. Spermatheca elongate, with duct narrow, bent in half of its length, with unilobate diverticulum. Prostates confined to segments 17 and 19; each originates as short, thin tube, and extends in recurved tubular prostatic gland.

Description:

External features: Body cylindrical. *Colour*: violet pigmentation present on alcohol-preserved material. Dorsally violet pigmentation extending to *b* setal lines; ventrally yellowish grey. *Dimensions*: holotype 50×2 mm; other material 49–70 mm long, 2–4 mm wide. *Segment number*: holotype 88. *Prostomium*: tanylobic, with wide obvious sutures. *Setae*: widely paired, postclitellarly $aa>ab$, $aa>bc$, $ab<cd$, *bc* nearly equal to *cd*. *Dorsal pores*: absent. *Nephridial pores*: externally not observed. *Spermathecal pores*: ventrolaterally, two pairs, each between *b–c*, close to intersegmental furrow 7/8 and 8/9, respectively, with obvious swellings. *Female pores*: paired, in 14 between *aa* setae. *Clitellum*: ring-shaped on 13–16,1/n17; anterior and posterior clitellar borders obvious. *Prostatic pores*: two pairs not approximated towards the mid-ventral line; on 17 and 19, respectively, on prominent papillae stretching out into curved hook (Figs 3, 4); on holotype both papillae large, conical, with hook-like extensions, encircling *b*; on paratypes anterior pair on large, conical papillae with hook-like extensions; posterior pair on prominent conical papillae. *Male pores*: paired, in 18, lateral to *b* setae. *Seminal grooves*: invaginated curved furrows. *Papillae*: minute oval disks on some preclitellar segments.

Internal characters: *Salivary glands*: slightly covering septum 4/5. *Gizzard*: reduced, narrow. *Septa*: all septa thin; 12/13 the most thickened. *Intestine*: commences abruptly in 15; preceded by enlarged, muscular region of oesophagus in segments 12–13, followed by valve in 14. *Typhlosole*: absent. *Lateral hearts*: three pairs; last pair slightly enlarged in 12. *Nephridia*: elongated, with small terminal vesicles. *Ovaries*: not observed, probably in 13, covered by decomposed tissues. *Testes* and *male funnels*: proandric arrangement; funnels large, in segment 10, free, iridescent. *Vasa deferentia*: not observed, covered by decomposing tissues. *Seminal vesicles*: two pairs, in 9 and 11; anterior pair commencing from ventral part of septum 9/10, extending dorsally over spermathecae of segment 9. Posterior pair commencing from septum 10/11, much smaller than anterior, extends dorsally into segment 11. *Spermathecae*: two pairs, in 8 and 9 (Fig. 5). Duct wide, bent at midlength, extending into irregular elongate ampulla; unilobate diverticulum attached to ampulla at duct/ampulla union. Spermathecal ectal ducts enter body wall near septa 7/8 and 8/9, respectively. Iridescent sperm present in diverticula. *Prostates*: two pairs, each confined to one segment; in 17 and 19. Duct originates as short, thin tube, and



Figs 3–5. *Chilota dilatus* sp. n.: (3, 4) ventral area of prostatic pores with prostatic pores and papillae, holotype and specimen NMSA/Olig.04525, respectively; (5) anterior right spermatheca, holotype, 400×. Abbreviations: A – ampulla, D – duct, U – unilobate diverticulum.

extends in once, or twice, strongly recurved tubular prostatic gland. *Penial setal retractor muscles*: commence at septa 17/18 and 18/19. *Penial setae*: *a* and *b* alike; stem slender, slightly curved, unornamented, smooth; approx. 0.9 mm long.

Holotype: NMSA/Olig.03360. *KwaZulu-Natal*: Highmoor State Forest (29°18'34"S:29°35'44"E), small montane *Podocarpus* forest, *ca* 20 cm deep under rock, 1.iii.2001, A.J. Armstrong.

Paratypes: NMSA/Olig.03807, 2 cl collected together with holotype.

Other material examined: *KwaZulu-Natal*: NMSA/Olig.03339, 6 cl, Blinkwater Nature Reserve (29°14'18"S: 30°27'30"E) under decomposing wood, 18.i.2001, A.J. Armstrong. NMSA/Olig.04535, 1 cl, Vernon Crookes Nature Reserve (30°15.976'S:30°37.187'E), forested area, rocky moist soil, under large casts probably discarded by *Microchaetus vernoni*, and other microchaetid species, 24.i.2007, J.D. Plisko, S.W. James, G.B.P. Davies.

Discussion: This species being proandric and having nephridia with terminal vesicles agrees with the *Chilota* generic characters. It is similar to *C. quindecimus* (redescribed below) by having commencement of the intestine in segment 15 and last pair of hearts in 12, but differs in the shape of the spermathecae, and in prominent prostatic hook-like conical papillae, in which prostatic pores are located. This shape of prostatic papillae is not known in other acanthodrilines. This specific feature was observed in mature individuals, suggesting that the hooked endings of the papillae may develop with age.

Biological notes and distribution: This species was collected during summer. It occurs in forest and bushes under decaying litter, in the top layer of soil. Remains of sperm, observed in male funnels and in diverticula, confirm earlier sexual activity. It is known only from KZN. The type locality is situated in the Drakensberg foothills and is a forested area with small patches of indigenous trees and grasses. Other material was collected from Blinkwater Nature Reserve, north-east of the type locality. The Blinkwater locality is a summit area of an elevated section of the escarpment overlooking the Umgeni River. The plateau is at some 1480 m above sea level, has no forest, but well-preserved montane grassland and various woody plants. In the valleys there are several pockets of indigenous bushes, and mistbelt bushes occur on the southern slopes. On the lower slopes extensive commercial plantations are found. During the summer the whole area receives much rain, and is often misty; the banks of streams are overgrown by ferns, lichens and moss. The area is also known as an important breeding site for a number of birds, including South Africa's most endangered bird, the blue swallow (Pooley & Player 1995).

The other collecting site is located south-east of the type locality, in the Vernon Crookes Nature Reserve, known for the occurrence of a number of *Microchaetus*, *Geogenia,* and *Tritogenia* species. The reserve, situated at 150–610 m above sea level, comprises diverse grasslands. Forested areas occur in valleys and ravines, embracing patches of riverine bushes. The species was found in forest in black soil overlying red, coarse soil, under large casts discarded by microchaetids *Microchaetus vernoni* Plisko, 1992, *Geogenia tuberosa*, Plisko, 1998, *G. zaloumisi* Plisko, 1992, and *G. parva* Michaelsen, 1913.

In one of the dissected specimens from the Blinkwater site, numerous parasitic nematodes were observed in some of the clitellar and postclitellar segments.

Chilota quindecimus Pickford, 1937

Figs 6, 7

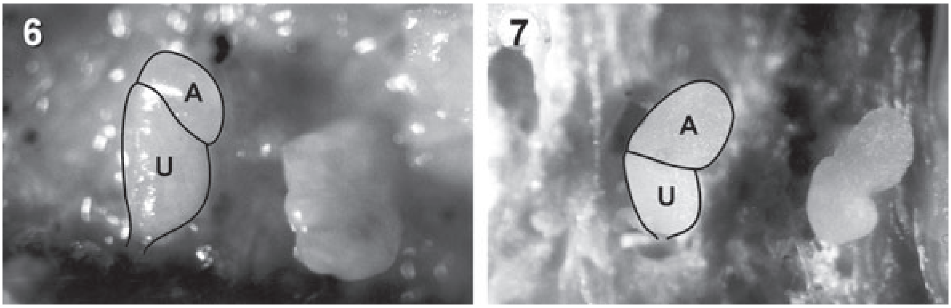
Chilota quindecimus: Pickford 1937: 526–528.

The original species description was based on one immature specimen. Recent collections of sexually developed material allow me to add more data on the species' morphology, as well as its distribution.

Diagnosis: Clitellum saddle-shaped on 13–16,1/n17. Prostatic pores on slightly swollen tissues. Salivary glands extending backwards beyond septum 4/5. Gizzard in 5, reduced to narrow, soft tube. Intestine begins in 15. Spermatheca ovoid, irregularly folded with short duct; diverticulum unilobate, sessile, overhanging union between spermatheca and duct. Two pairs of prostates; each pair confined to one segment, in 17 and 19.

Description:

External features: Body cylindrical. *Colour*: colouring and pigmentation of the new alcohol-preserved material differ slightly from the holotype and its original description, given as 'unpigmented'. New material kept in 75% alcohol for over three years is dorsally violet on 1–12 and last 7 segments; on 1–6, pigmentation extends to *b* setal lines, on 7–8 to *c*, on 9–12 to *a*; ventrally yellowish white. *Dimensions*: holotype 43 mm long, new material 43–52 mm long, 2–3 mm wide. *Segment number*: holotype 96, new material 82–99. *Prostomium*: tanylobous, with wide, obvious sutures. *Setae*: arrangement of setae in accordance with original description, widely paired, postclitellarly *aa*>*ab*, *aa*>*bc*, *ab*<*cd*, *bc* nearly equal to *cd*. *Dorsal pores*: absent. *Nephridial pores*: in original description indicated as being in the *c* setal lines; due to dissection of holotype the condition cannot be confirmed; on new material not observed externally. *Spermathecal pores*: ventrolaterally, two pairs, each between *b–c*, close to intersegmental furrow 7/8 and 8/9, respectively, each encircled by narrow elliptical mark. *Female pores*: paired,



Figs 6, 7. *Chilota quindecimus*, spermathecae, 400×: (6) holotype; (7) new material. Abbreviations: A – ampulla, U – unilobate diverticulum.

in 14 between *aa* setae, separated by about one third of *aa* space. *Clitellum*: specified by Pickford as circular on 13–16; it is difficult to confirm ventral clitellar tissues on holotype; on new material clitellum clearly saddle-shaped; dorsally overlapping part of segment 17; on 13 extending to *ab* setae; on 14–16 slightly below *ab*; anterior clitellar borders obvious, posterior borders faint. *Prostatic pores*: two pairs not approximated towards the mid-ventral line, on 17 and 19, respectively; in holotype on moderate papillae, on new material on swollen tissues. *Male pores*: paired, in 18, small openings lateral to *b* setae. *Seminal grooves*: very faint, curved furrows. *Papillae*: not observed on type material; minute, oval disks on segments 8–10 between *aa* setae on new material.

Internal characters: *Salivary glands*: extend backwards beyond septum 4/5, covering dorsally large anterior part of gizzard. *Gizzard*: in holotype and in new material reduced to narrow, cylindrical, soft tube. *Septa*: all thin; although some variations in thickness of septa observed, the most thickened usually 12/13. *Intestine*: commences abruptly in 15, preceded by enlarged, muscular region of oesophagus in segments 12–13, followed in segment 14 as constricted, much narrower part forming valves. *Typhlosole*: absent. *Lateral hearts*: last pair in 12, slightly enlarged. *Nephridia*: meganephridia; elongated, thin, with small terminal vesicles. *Ovaries*: in 13, small. *Testes* and *male funnels*: proandric arrangement; male funnels large, medially in segment 10, free, iridescent. *Vasa deferentia*: medially, run to 17 where they enter body wall and extend to small openings in 18. *Seminal vesicles*: two pairs, in 9 and 11; anterior pair large, commencing from ventral part of septum 9/10 as lobulate sacs extending dorsally, occupying large part of segment 9. Posterior pair commencing from septum 10/11, much smaller than anterior, lobulate, extending dorsally in 11. *Spermathecae*: two pairs, in 8 and 9; shapes of spermathecae in new material differ from those described and illustrated by Pickford (1937), but are similar to spermathecae observed and photographed in the holotype (Fig. 6) and new material (Fig. 7). Duct wide, bent, extending into moderate, ovoid ampulla; diverticulum unilobate, nearly as large as ampulla, sessile, connected at duct/ampulla union. Spermathecal ectal ducts enter body wall near septa 7/8 and 8/9, respectively. Iridescent sperm present in diverticula. *Prostates*: two pairs, in 17 and 19. Duct originates as delicate, short, thin tube; prostatic gland tubular, slightly folded, extending dorsolaterally. Each tubular gland together with prostatic duct confined to only one segment. *Penial setal retractor muscles*: commence at septa 17/18 and 18/19, respectively; thin, strong. *Penial setae*: *a* and *b* alike; stem slender, almost straight, curved at nearly half of its length; smooth, unornamented; distally slightly curved and pointed, smooth.

Holotype (examined): SAM A21680 (SAMC), 1 cl broken into three pieces. *KwaZulu-Natal*: Kranskop, xi.1917, K.H. Barnard.

New material examined: *KwaZulu-Natal*: NMSA/Olig.03719, 1 cl, and NMSA/Olig.03814, 2 mature with less developed cl, Swartkop Forest (29°35'36.267"S:30°15'10.878"E) from rotten log on forest floor, between dense herbaceous roots, 22.i.2003. NMSA/Olig.03723 1 cl & 1 juv, Swartkop Forest (29°35'36.402"S: 30°15'11.071"E), in rotting trunk lying between thick undergrowth and shrubs; all collected by A.J. Armstrong, L. Mnguni, G. Dittrich.

Distribution: Pickford (1937) described this species from 'Kranzkop, Natal', which probably refers to the area at or near the town of Kranskop (28°58'S:30°50'E), or its close neighbourhood, in the Midlands of KZN. New material was collected south-west of the type locality.

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